Phyllosilicate Deposits Within Miyamoto Crater

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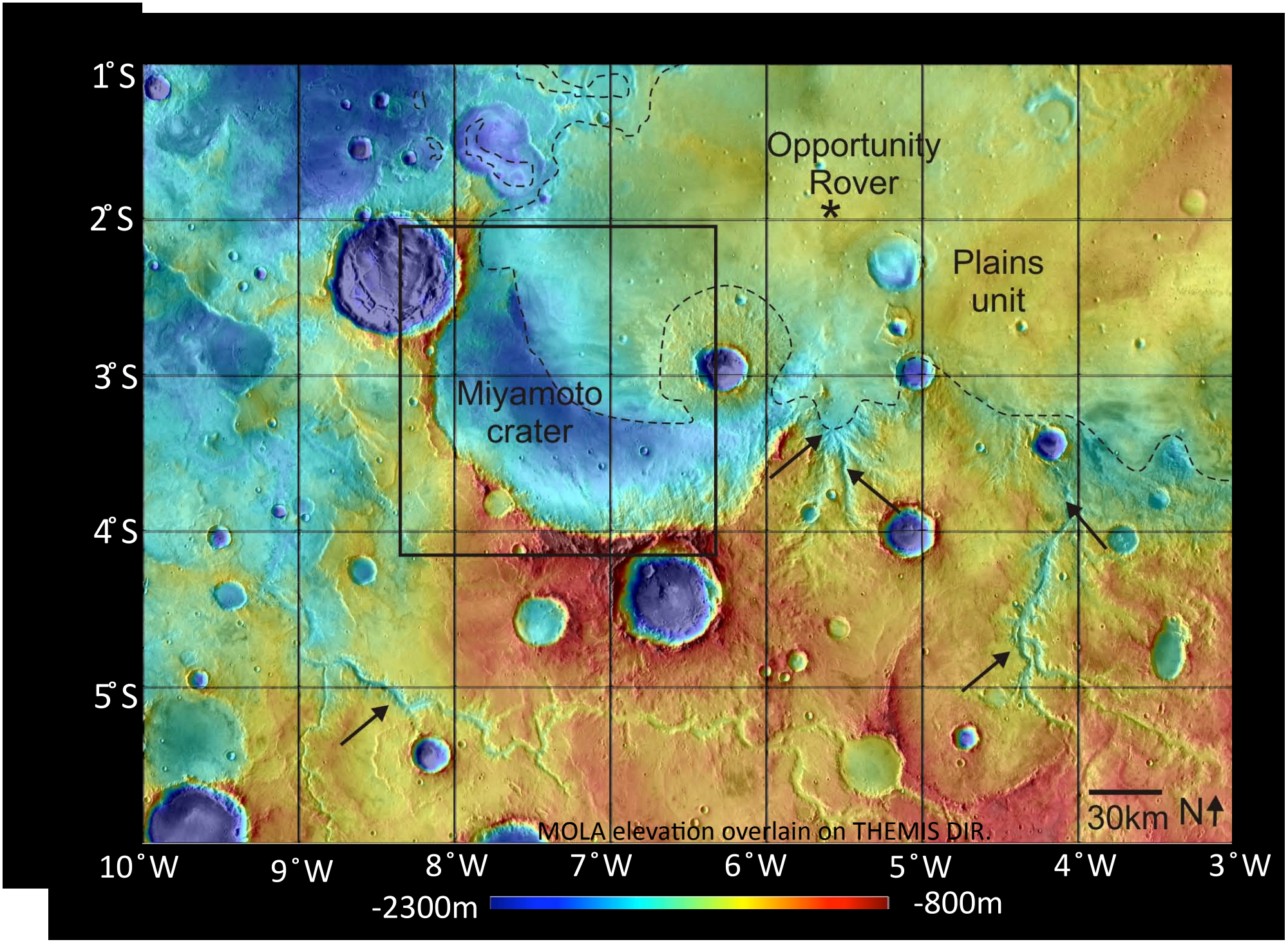
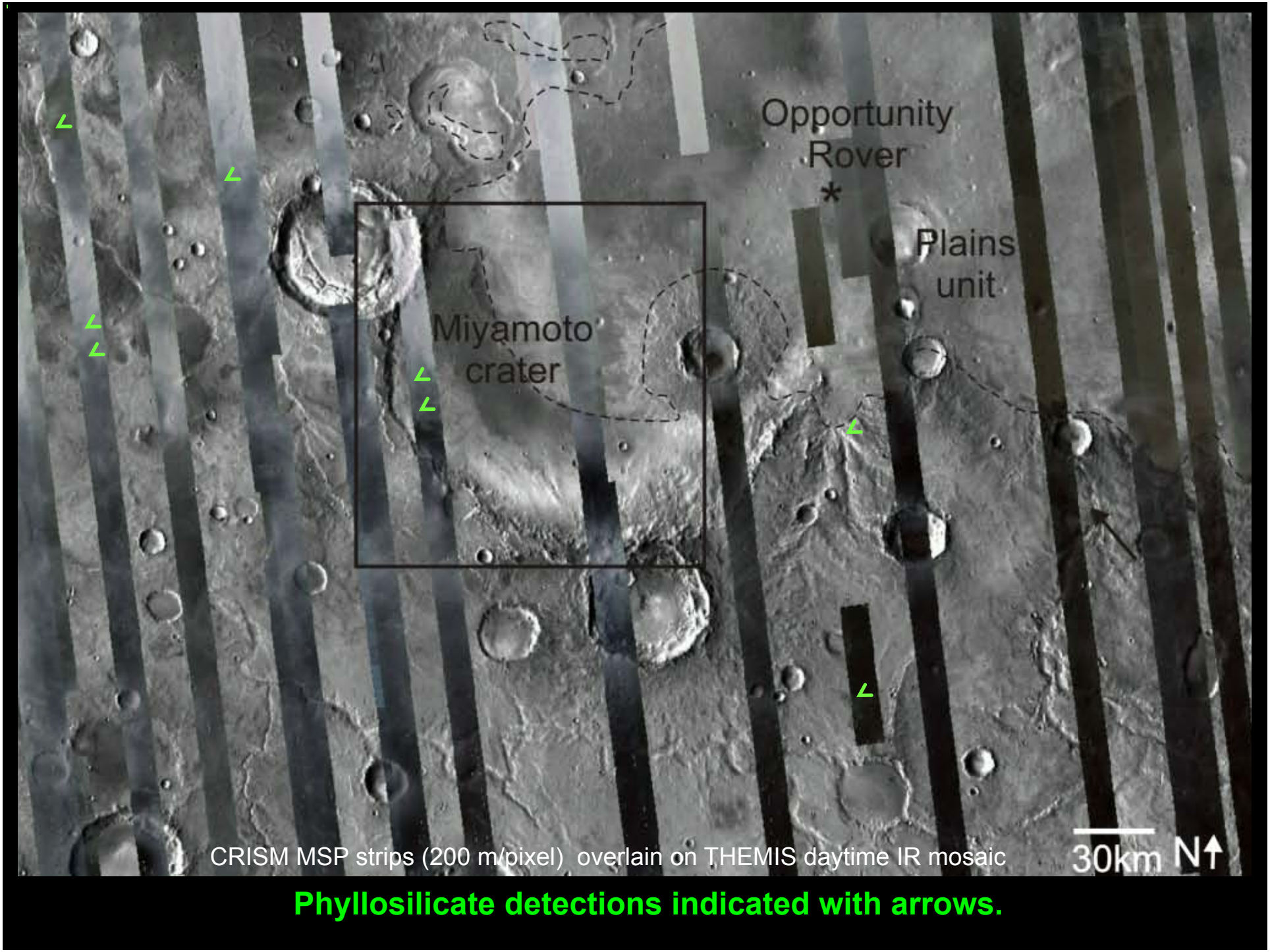
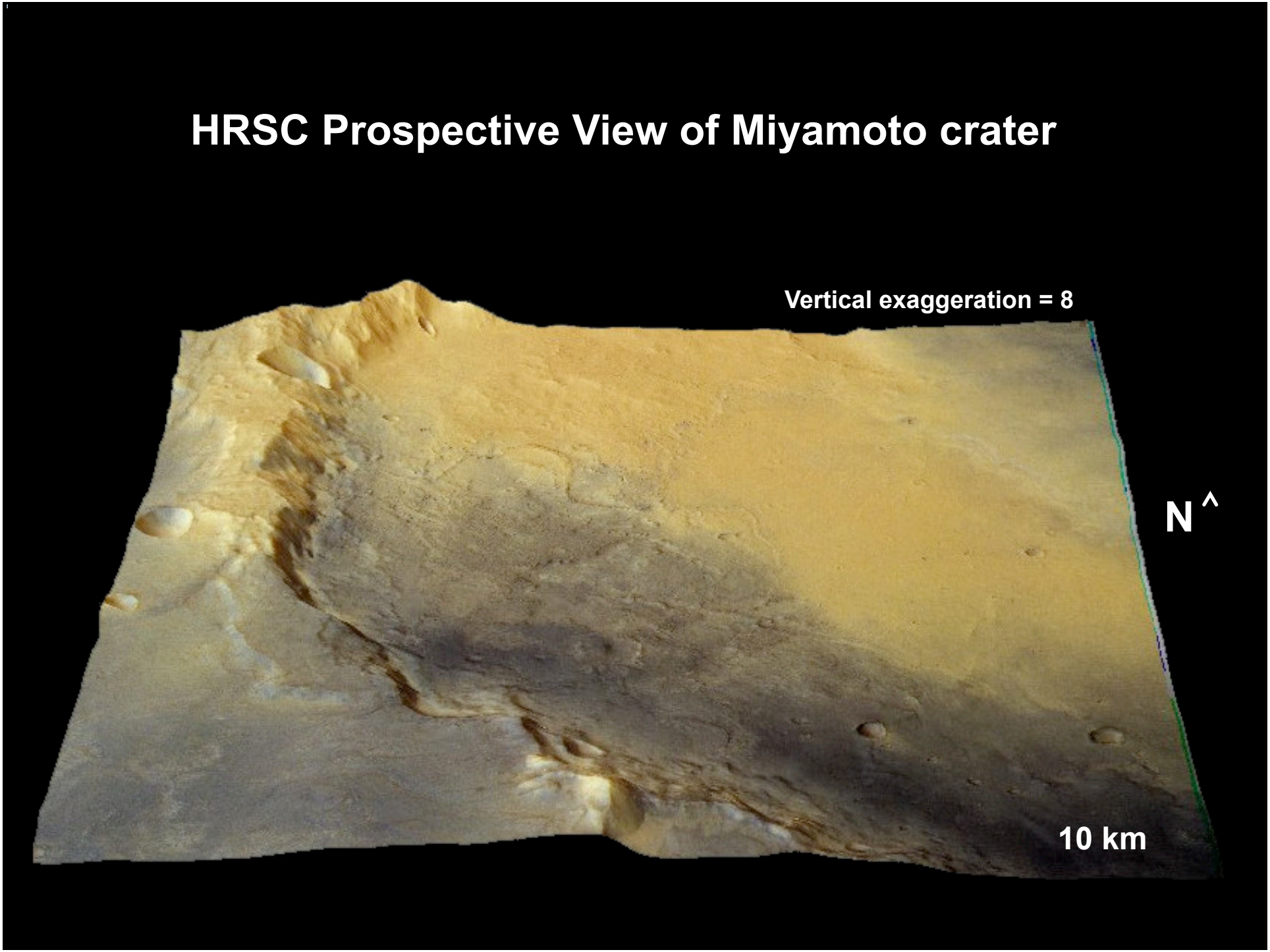
3nd MSL Landing Site Workshop 9/15/08

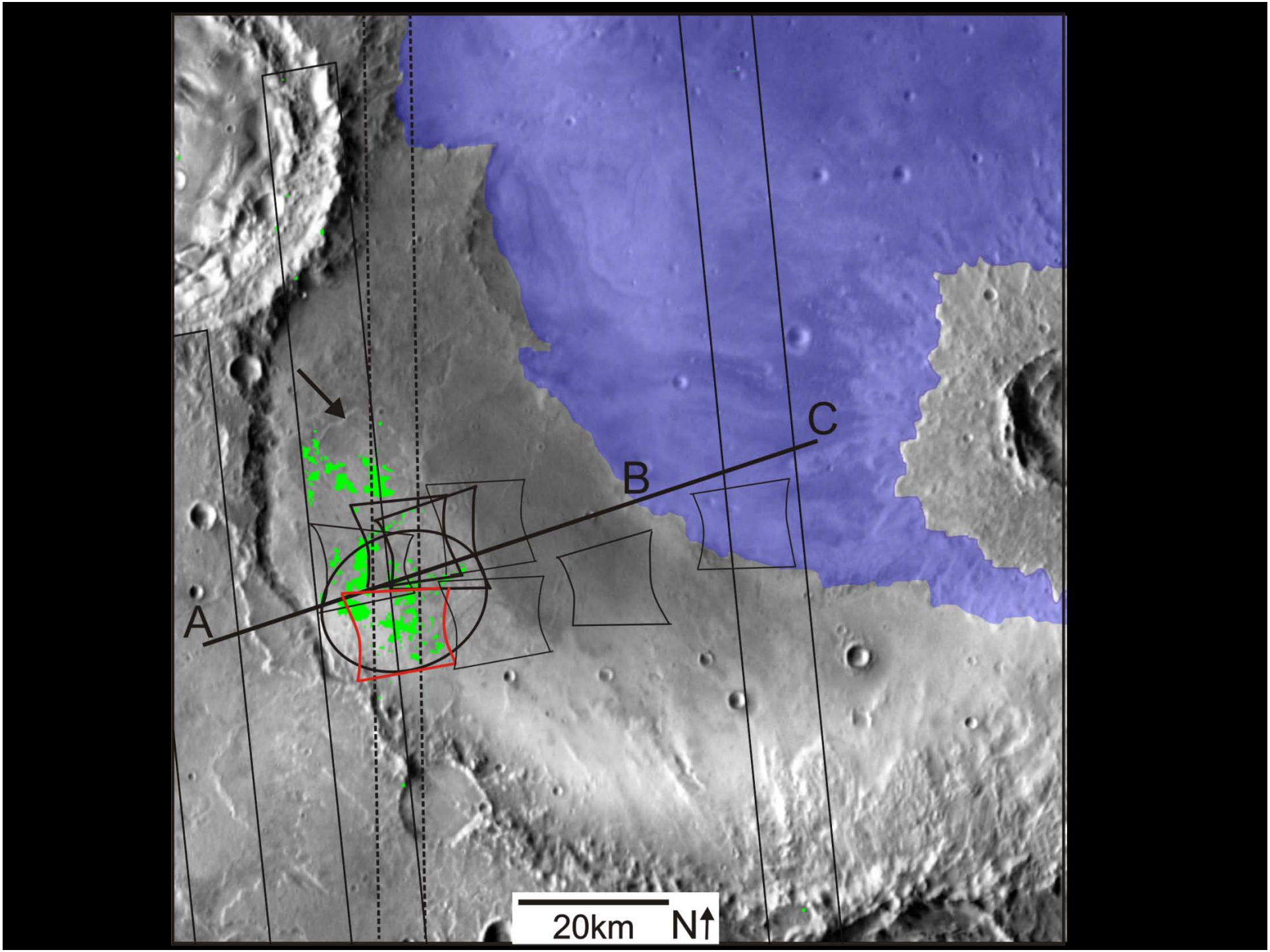

1°S
2°S
3°S
4°S
5°S
Opportunity Rover
Plains unit
Miyamoto crater
30km
N
MOLA elevation overlain on THEMIS DIR.
10°W
9°W
8°W
7°W
6°W
5°W
4°W
3°W
-2300m
-800m



Phyllosilicate detections indicated with arrows.

HRSC Prospective View of Miyamoto crater

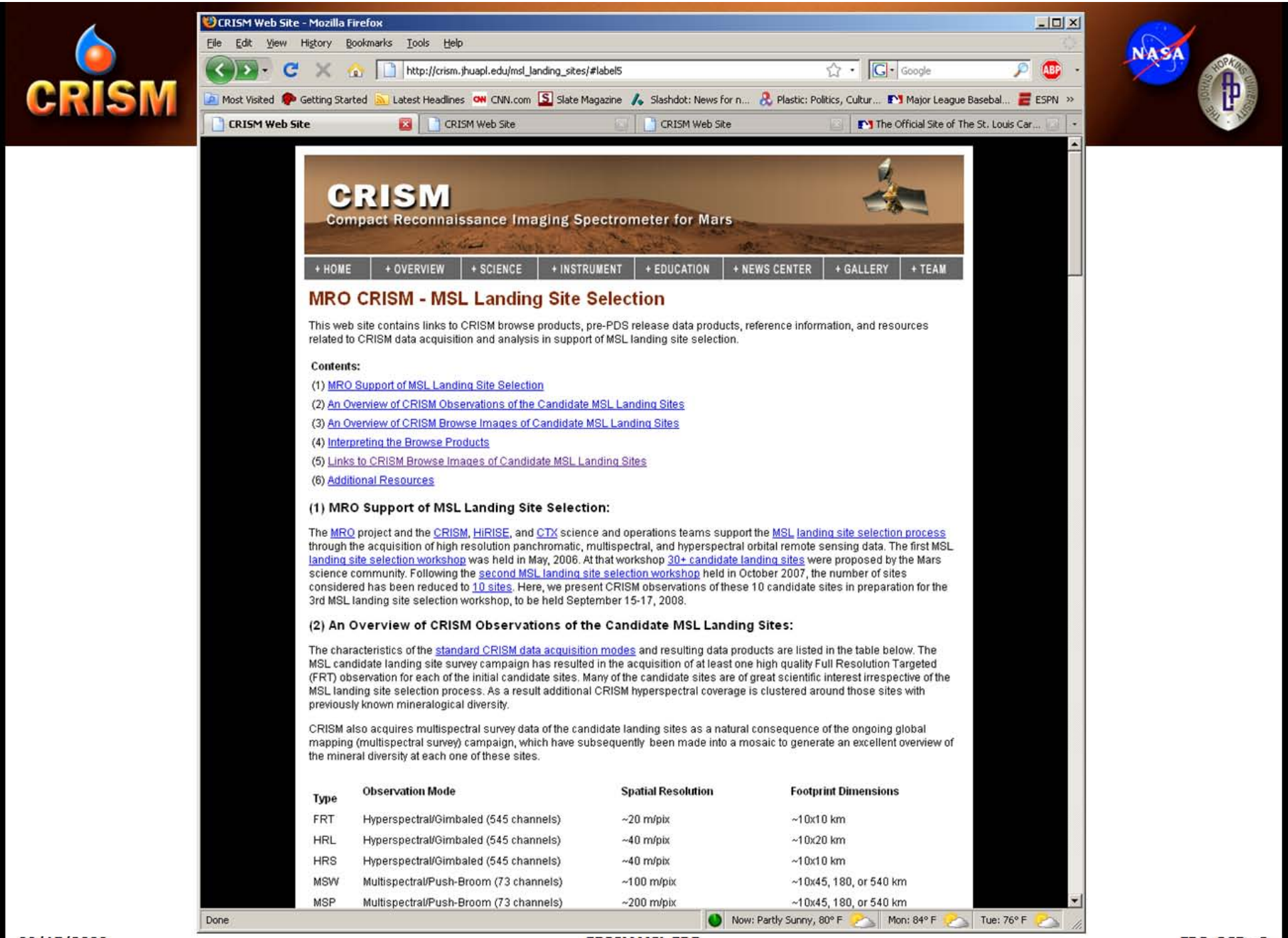



A
B
C
20km
N

CRISM MSL CDP

- Systematic development of CRISM analysis products for the MSL candidate landing sites
  - Consistent data processing and product generation provides framework for detailed spectral investigations
- CDP pipeline processing
  - CRISM targeted observations within 0.5° of each candidate ellipse center
  - Simple photometric and atmospheric correction
    - Includes application of time-dependent empirical atmospheric transmission spectrum
  - Robust data filtering
  - Calculation of hyperspectral summary parameters
    - Includes use of detector wavelength array where appropriate (spectral smile)
  - Evaluation of summary parameter cumulative statistics
    - MSL CDP observation set
    - Site-specific
    - Observation-specific
  - Rendering of browse products (RGB summary parameter composites) and enhanced band composites (RGB and grayscale)
  - Map projection – ellipse center projection origin

http://crism.jhuapl.edu/msl_landing_sites/


CRISM Web Site - Mozilla Firefox
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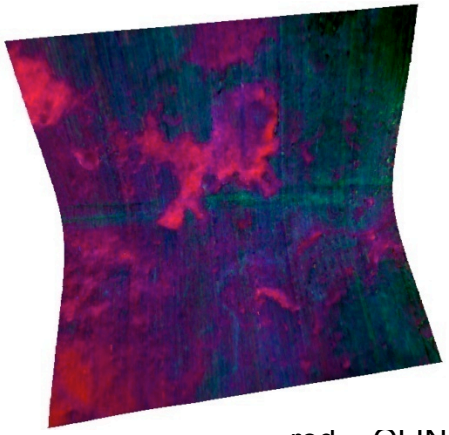
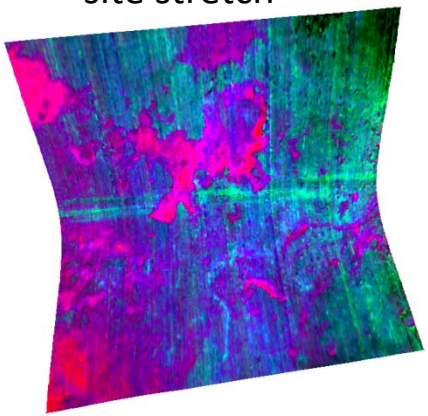
http://crism.jhuapl.edu/msl_landing_sites/#label5
Most Visited Getting Started Latest Headlines CNN.com Slate Magazine Slashdot: News for n... Plastic: Politics, Cultur... Major League Baseball... ESPN
CRISM Web Site
CRISM Web Site
CRISM Web Site
The Official Site of The St. Louis Car...
CRISM
Compact Reconnaissance Imaging Spectrometer for Mars
+ HOME + OVERVIEW + SCIENCE + INSTRUMENT + EDUCATION + NEWS CENTER + GALLERY + TEAM
MRO CRISM - MSL Landing Site Selection
This web site contains links to CRISM browse products, pre-PDS release data products, reference information, and resources related to CRISM data acquisition and analysis in support of MSL landing site selection.
Contents:
(1) MRO Support of MSL Landing Site Selection
(2) An Overview of CRISM Observations of the Candidate MSL Landing Sites
(3) An Overview of CRISM Browse Images of Candidate MSL Landing Sites
(4) Interpreting the Browse Products
(5) Links to CRISM Browse Images of Candidate MSL Landing Sites
(6) Additional Resources
(1) MRO Support of MSL Landing Site Selection:
The MRO project and the CRISM, HiRISE, and CTX science and operations teams support the MSL landing site selection process through the acquisition of high resolution panchromatic, multispectral, and hyperspectral orbital remote sensing data. The first MSL landing site selection workshop was held in May, 2006. At that workshop 30+ candidate landing sites were proposed by the Mars science community. Following the second MSL landing site selection workshop held in October 2007, the number of sites considered has been reduced to 10 sites. Here, we present CRISM observations of these 10 candidate sites in preparation for the 3rd MSL landing site selection workshop, to be held September 15-17, 2008.
(2) An Overview of CRISM Observations of the Candidate MSL Landing Sites:
The characteristics of the standard CRISM data acquisition modes and resulting data products are listed in the table below. The MSL candidate landing site survey campaign has resulted in the acquisition of at least one high quality Full Resolution Targeted (FRT) observation for each of the initial candidate sites. Many of the candidate sites are of great scientific interest irrespective of the MSL landing site selection process. As a result additional CRISM hyperspectral coverage is clustered around those sites with previously known mineralogical diversity.
CRISM also acquires multispectral survey data of the candidate landing sites as a natural consequence of the ongoing global mapping (multispectral survey) campaign, which have subsequently been made into a mosaic to generate an excellent overview of the mineral diversity at each one of these sites.
Type | Observation Mode | Spatial Resolution | Footprint Dimensions
FRT | Hyperspectral/Gimbaled (545 channels) | ~20 m/pix | ~10x10 km
HRL | Hyperspectral/Gimbaled (545 channels) | ~40 m/pix | ~10x20 km
HRS | Hyperspectral/Gimbaled (545 channels) | ~40 m/pix | ~10x10 km
MSW | Multispectral/Push-Broom (73 channels) | ~100 m/pix | ~10x45, 180, or 540 km
MSP | Multispectral/Push-Broom (73 channels) | ~200 m/pix | ~10x45, 180, or 540 km
Done
Now: Partly Sunny, 80° F
Mon: 84° F
Tue: 76° F

CRISM CDP Products (F. P. Seelos and O. S. Barnouin-Jha)

FRT BD84 IR_MAF regional stretch

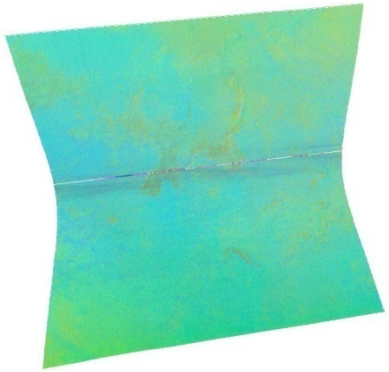


FRT BD84 IR_MAF site stretch

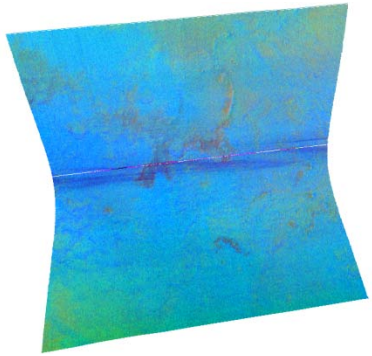


red = OLINDEX (olivine)
green = LCPINDEX (low-Ca pyroxene)
blue= HCPINDEX (high-Ca pyroxene)

FRT BD84 VNIR_FEM regional stretch

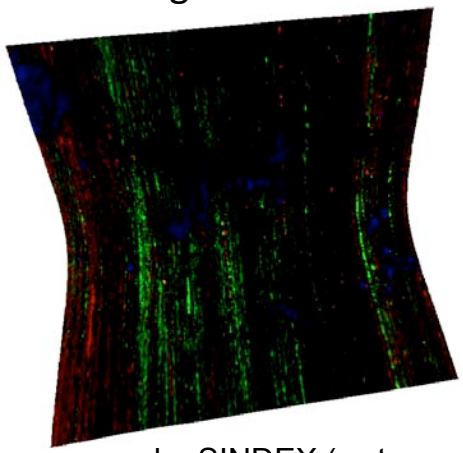


FRT BD84 VNIR_FEM site stretch

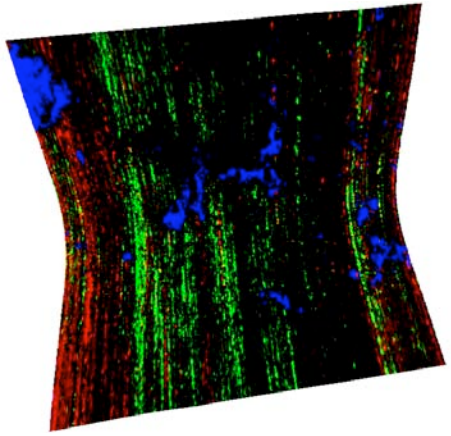


red = BD530 (ferric minerals)
green = SH600 nm (coatings)
blue = BDI1000nm (variety of iron minerals)

FRT BD84 IR_HYD regional stretch

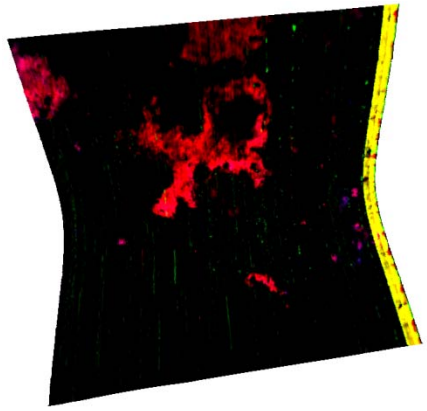


FRT BD84 IR_HYD site stretch

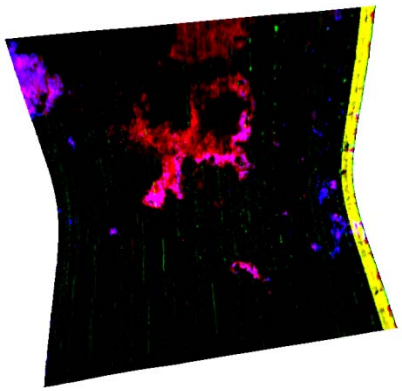


red = SINDEX (water-containing minerals)
green = BD2100 nm (monohydrated sulfates)
blue = BD1900nm. (hydrated sulfates, clays, or glass)

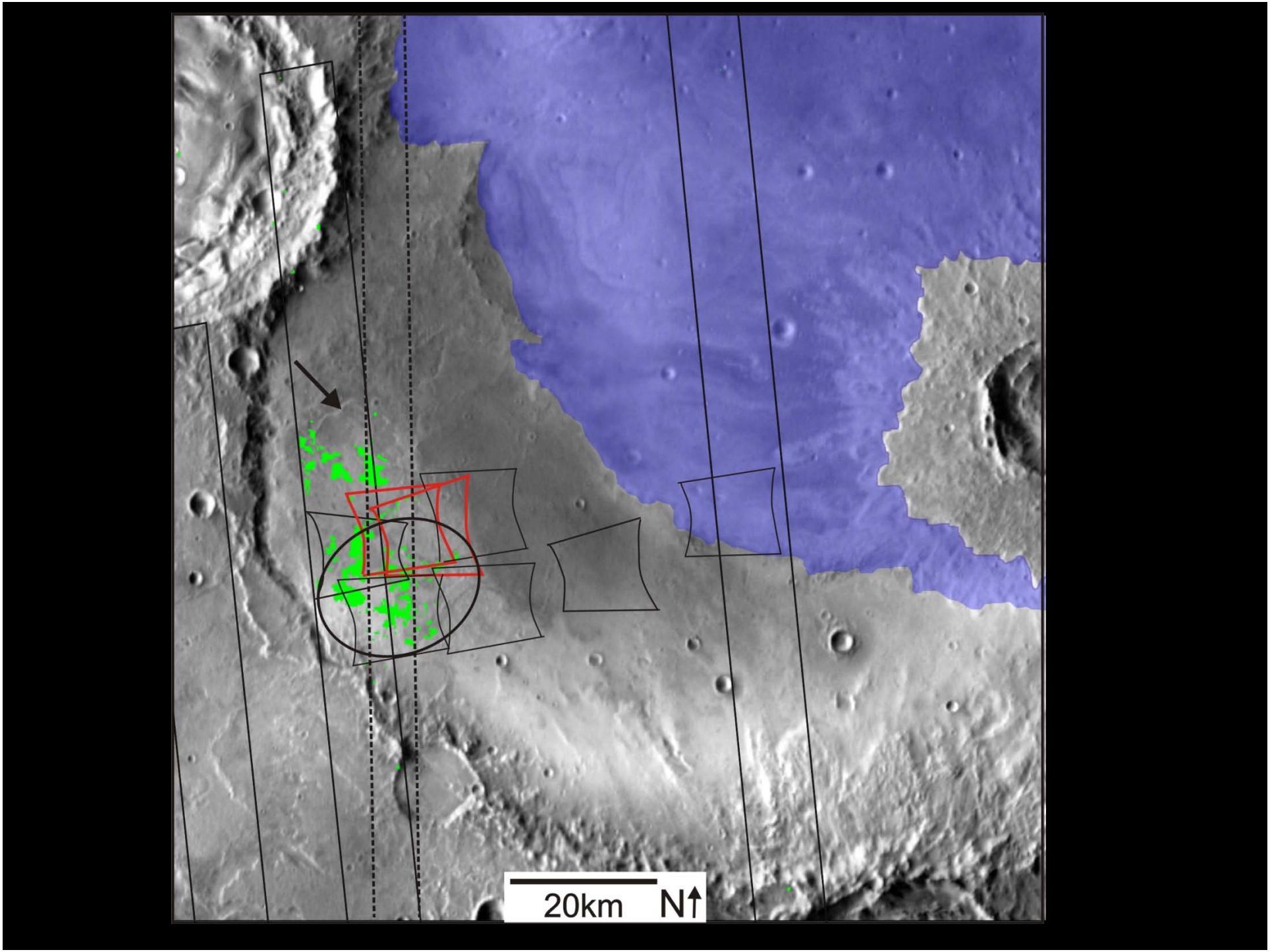
FRT BD84 IR_PHY regional stretch



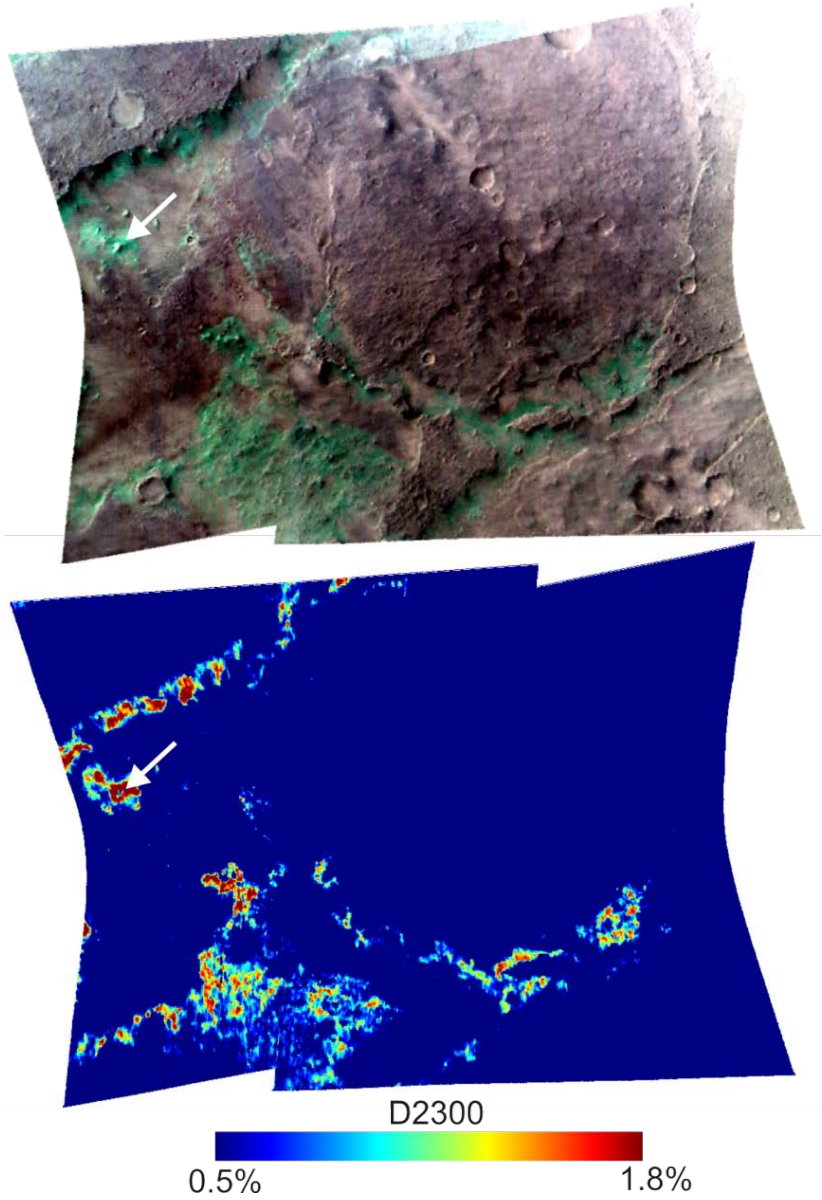
FRT BD84 IR_PHY site stretch



red = BD2300 (Fe/Mg phyllosilicate)
green = BD2210 (Al phyllosilicate or hydrated glass)
blue=BD1900 (hydrated sulfates, clays, or glass)

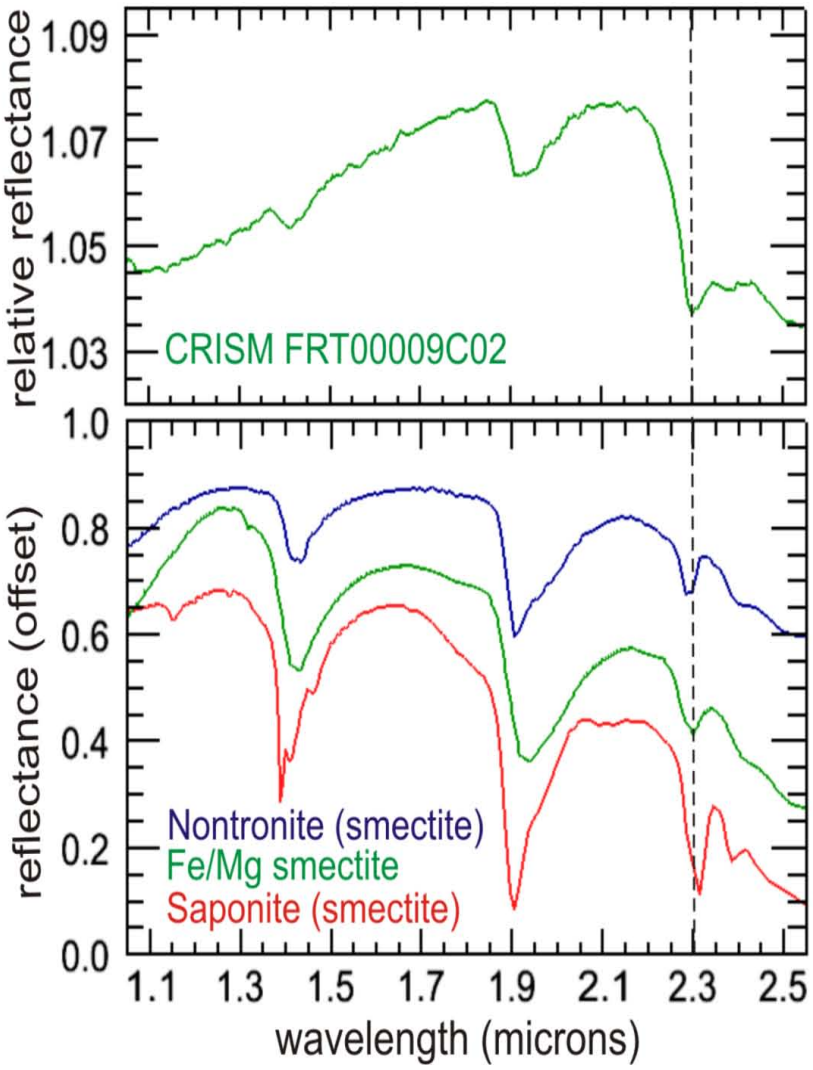

20km
N

CRISM FRT 9C02 and FRT 979C

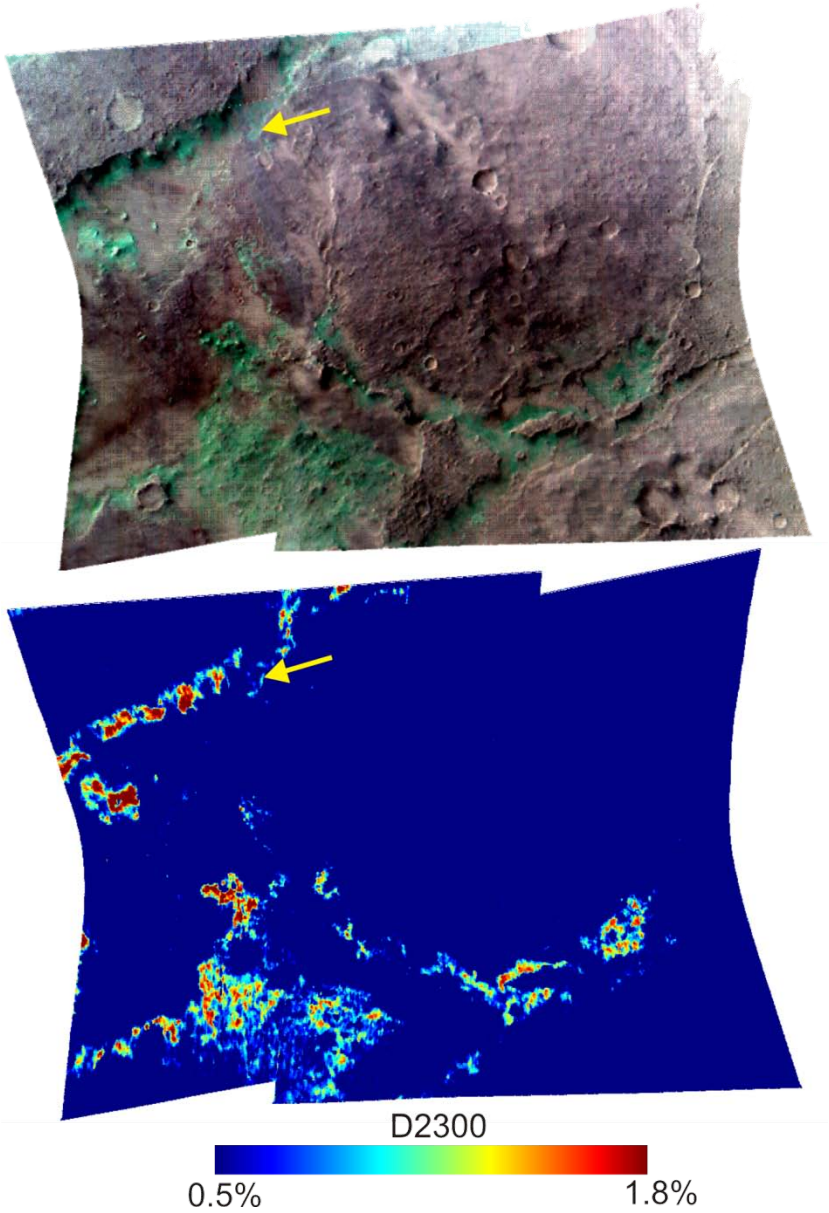


Upper: R = 2.5 µm – D2.30 value, G = 1.8 µm, and B = 1.1 µm

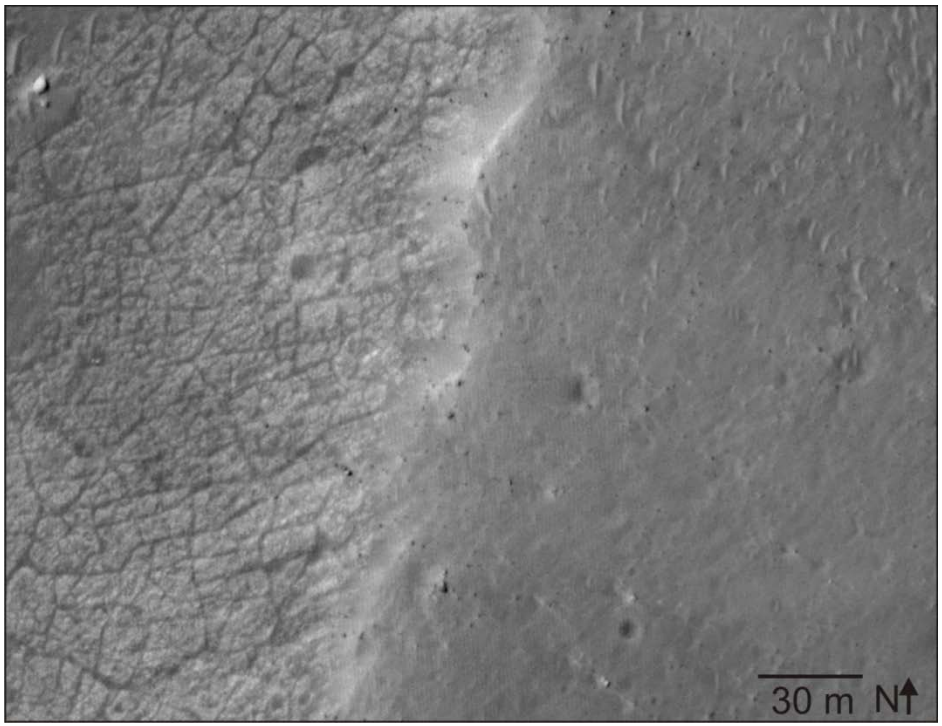
CRISM and Laboratory Spectra



CRISM FRT 9C02 and FRT 979C

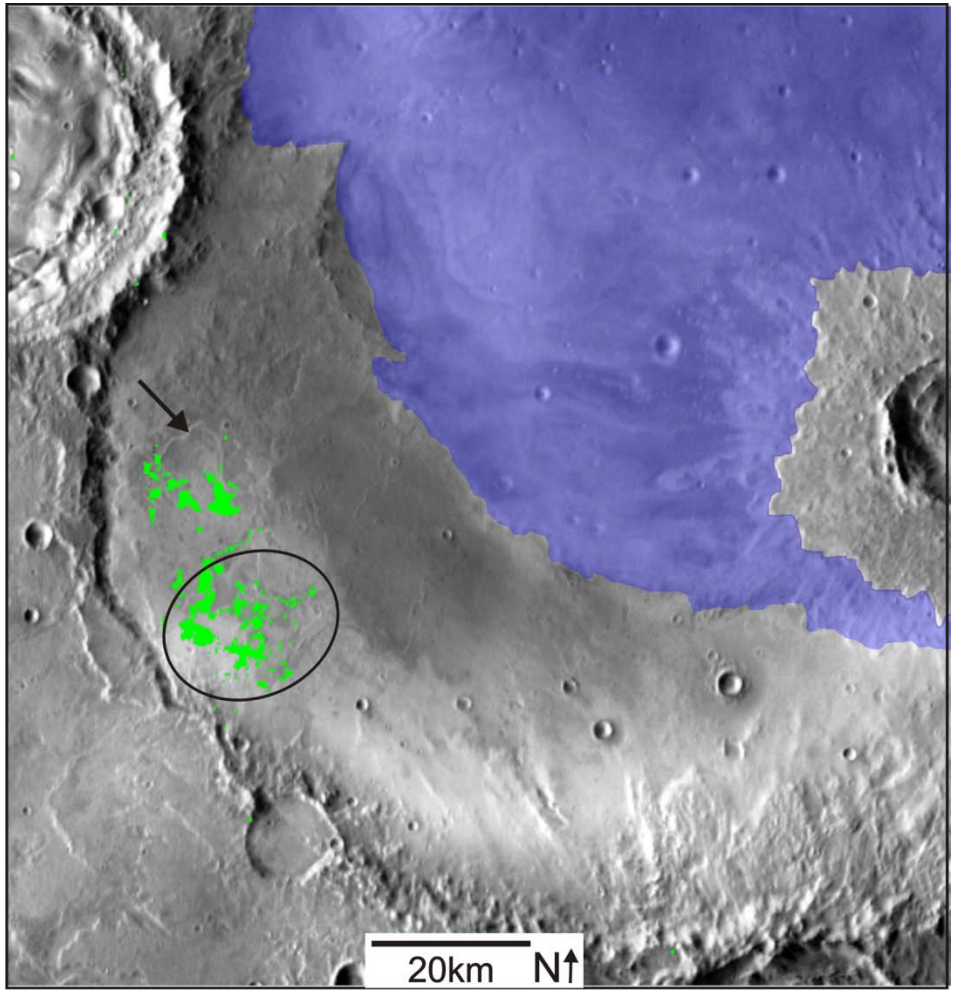


PSP 007124_1765 subset

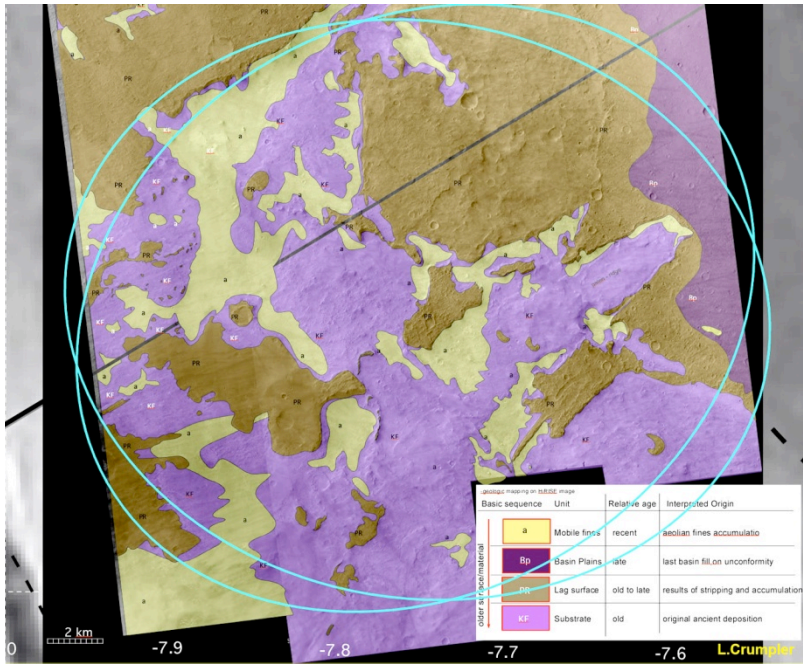


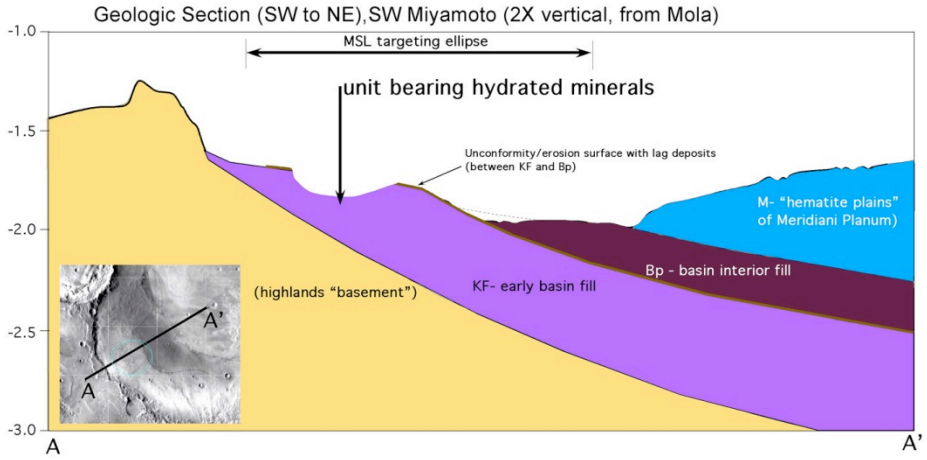
- Phyllosilicate deposits correspond to in place basal unit
- Phyllosilicates exhumed

Geologic map on HiRISE, produced by Larry Crumpler



CRISM D2300 detections overlain on THEMIS daytime IR. Green → Fe/Mg smectite





Discussion

- Good geologic context
  - Crater floor deposits
  - Older phyllosilicates exhumed
    - Predate formation of plains unit analyzed by MER Opportunity rover
- Diversity
  - Phyllosilicate (Fe/Mg smectites) throughout landing ellipse
    - Within basal unit
  - Inverted channel deposits → fluvial activity
  - Sulfate and hematite plains unit (~40 km from ellipse)
- Preservation potential
  - Smectite clays → GOOD
    - Biomarkers, fossils
  - Depositional environment
- Habitability
  - Geochemical conditions implied by phyllosilicates
  - Evidence for surficial water (inverted channels)